REMARKS

Claims 1-8 were previously allowed. Claims 9-11 were previously rejected under 35 USC §103(a) as obvious in view of **Yoshiyuki** (JP 8-229747) when read with **Lin** (US 2003/0192861).

The allowance of claims 1-8 has now been withdrawn. **Claims 1-3, 5, 6, 9-11** now stand rejected under 35 USC §103(a) as obvious in view of **Yoshiyuki** when read with **Lin** and **Katoaka** (JP 5-329714 - issued as patent JP 405329714).

Claim 4 stands rejected under 35 USC §103(a) as obvious in view of **Yoshiyuki** when read with **Lin**, Katoaka, and **Nagata** (US 6,211,480).

Claim 7 stands rejected under 35 USC §103(a) as obvious in view of **Yoshiyuki** when read with **Lin**, **Katoaka** and **Yokomichi** (US 2005/0077269).

Claim 8 stands rejected under 35 USC §103(a) as obvious in view of **Yoshiyuki** when read with **Lin**, **Katoaka**, and **Gleason** (US 6,127,642).

(1) With respect to the above-cited references, Yoshiyuki is relied upon for an electrode guide holder (element 19) mounted on an electrode holder (element 34) in a magazine having an electrode (element 17), mounting the electrode holder on a member (element 13), moving the electrode guide to a distal end of the electrode to support the electrode (step 3, para. 6), moving the electrode and workpiece relative to each other and starting EDM (machining). The Examiner has alleged that Yoshiyuki does not rotate his spindle (element 13).

The Examiner's reading of Yoshiyuki is agreed to-in-part and traversed-in-part. In addition applicant now offers a contradictory/alternate partial translation of Yoshiyuki, paragraphs [0008] through [0010]. See EXHIBIT "A" attached. This translation discloses that the Yoshiyuki spindle "is pivotable about a center axis", i.e., the Yoshiyuki spindle 13 rotates.

(2) Lin is relied upon for a rotating spindle 6 in an EDM (machine) which rotates an electrode.

While this is true, Lin adds nothing in this regard to Yoshiyuki as Yoshiyuki teaches a spindle 13 which rotates. See the offered alternate partial translation, EXHIBIT "A", attached.

(3) Katoaka is relied upon for a gripping element (element 10, fig. 8) for moving a tool into position. Katoaka explicitly recites that his claw has two shapes, that of element 10 in fig. 8 and that of element 64 in fig. 2. Katoaka explicitly recites that his claw (10 or 64) grasps the respective electrodes 11 (fig. 7) and 24 (figs. 1, 5) by a projecting stud.

Katoaka does not show a long, narrow, hollow electrode as applicant does, because Katoaka is not concerned with the same kind of machining as applicant. Katoaka shows a heavy, cylindrical-shaped electrode which does not need an electrode holder, but is coupled directly to his spindle 22 extending from his head 21. Applicant uses a long "needle-like" electrode which can flex when rotated. Applicant requires an electrode holder 23 to couple his electrode 21 to his machine spindle 13 and does not grip his electrode directly. Therefore the Katoaka gripping element is in-appropriate for gripping an electrode holder 23 or an electrode guide holder 25 as disclosed by applicant.

(4) Nagata is relied upon for an electrode holder (element 3) with a flow path (element 26a) supplying fluid into a pipe electrode. This structure is shown in detail in Nagata fig. 2. It is obvious that the Nagata electrode holder is not intended to be detachable from his spindle draw bar 26a. The Nagata collet holder 45 extends downward form electrode holder 3 and electrode 1 upper end is slightly above the seal 46 which is acted upon by collet 4 and nut 47. Moreover, Nagata mounts his electrode 1 directly to his collet holder 45 which appears permanently

attached to the spindle draw bar 48 via the electrode holder block 3. See Nagata's process steps, fig. 6. Nagata is concerned with stabilizing and guiding the tip position of his electrode, not the mounting of his electrode in his machine spindle.

Applicant's claims, including claim 4, as just examined and rejected each recite that applicant's electrode holder is "detachably attached to applicant's spindle. It is clear from applicant's claims that his electrode is held by his electrode holder which sub-assembly is attachable and removable from applicant's spindle. This is not the situation with Nagata. Therefore, the standing rejection of claim 4 is traversed.

(5) Yokomichi is relied upon for an electrode guide holder with a taper end (element 77a, fig. 6). However, fig. 6 taken as an exploded cross-sectional view from fig. 3 is not of an electrode guide holder, but of electrode guide 41 of fig. 3. Likewise, fig. 4 taken as an exploded cross-sectional view from fig. 3 is of an electrode holder 27.

Applicant's claims including claim 7 as just examined and rejected recite that his electrode guide holder 25 has a tapered-shaped distal end on which electrode guide 61 is detachably mounted. In order to detach electrode guide 61 applicant either loosens set screw 63 (fig. 6) or loosens the screw 47 slotted portion 45 (fig. 2). Yokomichi shows no screws for detachable mounting, nor does Yokomichi recite any detachment ability. Yokomichi's structure appears to be press-fit, which generally precludes selectable detachment. Further, as Applicant's claim 7 depends from claims 1 or 2, applicant has also recited that his electrode guide holder is detachably mountable on his electrode holder 23. This is not true of Yokomichi. Therefore, the standing rejection of claim 7 is traversed.

(6) Gleason is relied upon for an anti-vibration guide element 36. Gleason does show such an element. However, as applicant's claim 8 depends from claims 1 or 2 and as such should now be considered allowable.

(7) The cited prior art:

Yoshiyuki:

The principal reference, Yoshiyuki (JP 08-229747), is assigned to Makino Milling Machine Co. Ltd., the assignee of the present application (US 10/523,052). Yoshiyuki teaches an electrode handling improvement for an automated electric discharge machine.

Electric Discharge Machining (EDM), sometimes called spark machining or spark eroding can be utilized in a CNC machine (computer numerical controlled machine) environment for making very small and intricate cuts and holes, usually in a metal work piece. EDM machines utilize electrodes which wear/erode as a job progresses and must be replaced, often times in the middle of a machining job. Some of these electrodes are very thin and can bend very easily. A bent electrode can produce a machining error. Also when an electrode is rotated during drilling it can shift. Furthermore, when an electrode is replaced and is not correctly aligned with the hole a machining error will occur.

The Yoshiyuki invention is concerned with avoiding these errors.

Yoshiyuki discloses an automated EDM machine, with an electrode handling sub-system for replacing worn EDM electrodes from a supply of new electrodes stored in a magazine 33. Each electrode 17 is mounted on an electrode holder 19 which travels with the electrode 17. An electrode 17 is held by the electrode holder 19 to the main output shaft 13 which is driven by the machine head 11. A chucking collet 16 holds the electrode 17 to the electrode holder 19 and a separate chuck 15 holds the electrode holder 19 to the output shaft 13. The Yoshiyuki electrode 17 rotates.

Yoshiyuki utilizes a combination of a robotic support guide 23 and a robotic guide block 29 to align a new/replacement electrode 17 properly with a hole in a work piece 6. Each guide block 29 has a fixed arm 36 and a juxtaposed movable arm 39 whose position relative to the fixed arm 36 is controlled by an air cylinder 40. Each arm 36, 39 has a respective notch 35, 37 juxtaposed to each other and defining a hole through which an electrode 17 loosely extends. An electrode 17 is grasped when the air cylinder 40 causes the movable arm/block 39 to close on the fixed arm 36. The guide block 29 exchanges electrodes. After the electrode 17 is in the

chuck the guide 29 is used to position the electrode 17 into the support guide 23. The lower support guide 23 is positionable directly over the work piece 6 to control the position of the tip of the electrode 17.

Lin:

Lin (US 2003/0192861) shows an EDM drill with an automated electrode replacement system. However, Lin is not concerned with the work piece placement of an electrode 7, as is Yoshiyuki. Thus Lin does not have an automated support guide and guide block working to position an electrode in a hole as does Yoshiyuki.

Lin concentrates on the selection and removal of electrodes 7 from his storage carousel 42. Lin holds his electrode 7 to his machine spindle 6 with a collet 612 which includes a seal 71 extending annularly about the electrode 7. The collet 612 tightly grasps the electrode 7 when a spindle nut 61 is tightened down on the spindle 6.

Lin's electrode 7 storage carousel 42 has a plurality of individual electrode storage units 41 into which electrodes 7 are mounted and later removed for use. Each individual storage unit has a C-channel shaped, frame member 411, a bracket with a cone-shaped tube guard 414, a top plate (un-numbered) to which a block (un-numbered) is mounted. This block holds a spring 412 and four posts (un-numbered) onto which an electrode holder 413 mounts. The collet 612 seats in a cavity in the top of the electrode holder 413. The cavity is also shaped to receive and hold a spindle nut 61.

Lin's device "chucks" an electrode 7 by having the spindle 6 approach the spindle nut 61 which motion moves the holder 413 to compress the spring 412. The spring 412 applies an outward force on the nut 61 against the spindle 6. The spindle 6 turns and tightens on the nut 61 as the nut is held stationary by the holder 413. As the nut 61 is tightened on the spindle 6 the collet 612 tightens on the electrode 7. There is no apparent turning of the collet 612 nor of the electrode 7.

The holder is prohibited from turning by the four posts extending there through. Once the electrode and holder are mounted onto the spindle, the assembly can be raised out of the storage unit.

To "un-chuck" Lin's electrode 7, the reverse procedure is followed. The spindle 6 lowers the assembly onto an empty storage unit 41. The holder 413 is held from turning by the four posts. The spindle 6 loosens the nut by a reverse rotation. The spindle 6 retracts and the holder 413, used electrode 7, collet 612 and spindle nut 61 remain with the storage unit 41.

Kataoka:

Kataoka (JP 405329714 A) shows a robot arm device for removing electrodes 24 from an EDM 20 and for placing a new electrode 24 on the EDM 20.

A two armed claw-shaped gripper member 64 grasps each electrode 24. The opening and closing movements of the claw 64 is controlled by a grasp member 60. The robot arm is capable of rotating (twisting) about its guide arm 58; of extending the claw longitudinally outward and inward under the operation of air driven extension cylinder 67; of rotating about the vertical axis of support shaft 32; and of being raised or lowered on support shaft 32.

The Kataoka robot arm has two degrees of linear motion and two degrees of rotational motion for engaging and manipulating with an electrode with the claw 64 which opens and closes.

Nagata:

Nagata (US 6,211,480) shows an EDM machine with an intermediate electrode guide 27 disposed on an intermediate guide arm 14. This intermediate electrode guide 27 is positioned between the primary electrode guide 8 and an electrode holder 3. The Nagata electrode 1 holder 3 is mounted on his draw bar 48. Extending downwardly from the electrode holder 3 is a collet holder 45. The collet holder 45 has a tapered inner wall at the bottom end into which the collet 4 is wedged. A seal 46 surrounds the electrode and is squeezed when a nut 47 is tightened over the end of the collet holder 45.

The primary guide 8 is positioned on a guide arm 10, generally immediately above the work piece 2. It includes a guide holder 9. The intermediate guide 27 is positioned on a mounting plate 20 connected to an intermediate guide arm 14. The intermediate guide 27 includes a tapered guide 24, a bearing 19, and an intermediate chuck 11. The intermediate chuck 11 has a rubber elastic body. An intermediate chuck holder 12 holds the intermediate chuck 11 on a lower extension to the intermediate guide arm 14 and is able to rotate with the electrode 1 via a bearing 13 mounting. The electrode 1 is prevented from shifting.

Yokomichi:

Yokomichi (US 2005/0077269) uses a water jet (WJ) to guide his electrode 39 toward a work piece (W). EDM (machining) is conducted while a gas is released from an electrode guide into a working fluid via a fluid channel.

Yokomichi mounts his single electrode guide 41 on a support plate 43 connected to a feed screw 21. The Yokomichi electrode guide 41 aligns his electrode 39 with the work piece (W) hole position and keeps the electrode from shifting. An electrode holder 27 connects the electrode 39 with a rotation shaft. The unit 19 is vertically positionable. Yokomichi is able to eliminate mechanical bearings and bushings with the use of an "air bushing" and a fluid jet electrode positioning.

Gleason et al:

Gleason (US 6,127,642) teaches an EDM machine having a lower guide 28 for positioning the electrode 20 tip above the work piece and an intermediate guide 36 to support the electrode to reduce electrode 20 flexing. The electrode 20 is chucked 18 to a drive 32. As the electrode 20 is rotated, dielectric fluid is pumped down the inside of the electrode 20 and into the drill hole 16 in the work piece 12. The mid-guide support 38 which holds the mid-guide 36 can be mechanically positioned for height on rods 44 by a tightening screw 46.

(8) The present invention:

In the present invention, a principal shaft/spindle 13 extends downwardly from the head 11 and is capable of rotating when rotationally driven by the second servo motor 17. A first chuck 15 and a collet 16 for grasping the electrode 21 are positioned on the lower end of the shaft 13. The electrode 21 is held within an electrode holder 23 which travels with the electrode 21. A second chuck 19 holds the electrode holder 23 to the end of the spindle 13. An electrode guide holder 25 is positioned over the electrode holder 23 and protects the electrode holder 23 when the assembly is stored in a storage magazine 34, and during handling between the storage magazine 34 and the EDM.

The electrode guide holder 25 fits over the electrode holder 23, and is fixedly engaged thereto when a plurality (4) of projection tabs 53 on the electrode holder 23, having passed through a respective plurality (4) of recesses 67 on the electrode guide holder 25, then engage a plurality of respective projections 65 on the guide holder 25, and are pressed there against by the force of a spring 73 to fix the engagement.

The guide holder 25 to electrode holder 23 engagement action includes the following steps: align, insert, twist and release to spring lock. Disengagement occurs by first pushing, twisting to align the tabs 53 with recesses 67, and then release to allow the electrode guide holder 25 to drop down and away from the electrode holder 23 under the spring 73 initial force.

An electrode holder replacement arm 91 delivers a replacement electrode 21, with its holder 23 and guide holder 25, from the magazine 34 to a position immediately below the second chuck 19. The gripper arm 29 (i.e., guide holder support 29) disengages the electrode guide holder 25 from the electrode holder 23. This can be done by a combination of up/down movements of the guide holder support arm 29 and a rotation of the shaft 13. Or, alternatively, by having both the longitudinal and rotational movements performed by the guide holder support arm 29.

The guide holder support arm 29 then slides the guide holder 25 down the length of the electrode 21 to hold it at a position immediately above the hole position in the work piece 1. The guide holder 25 thereby controls the tip position of the electrode 21 for machining. An intermediate position, anti-vibration guide 93 can be employed.

The water or dielectric fluid is pumped down the hollow electrode 21 during ED machining.

Applicant provides two embodiments for his electrode guide holder 25, which are shown in Fig. 2 and Fig. 6. Both embodiments utilize tabs to hold the electrode holder 23 carrying the electrode 21 to the electrode guide holder 25. Both embodiments use spring biasing to keep the tabs together. Both embodiments use a sapphire/ceramic electrode guide member 61 at the bottom of the guide holder 25 to extend beyond the walls thereof. Both embodiments use a holding section 51 having a tapered spring collet 41 and a tapered gripper section, the collet 41 being spread by a nut 43 tightened onto the gripper section. Both embodiments use a pushing piece 71 biased by the spring 72 to separate the electrode guide holder 25 from the electrode holder 23.

(9) Conclusion:

The present invention has the feature wherein the electrode guide holder 25 is releasably engaged from the electrode holder 23, and the electrode guide support means 29 moves the electrode guide holder 25 in a direction of the axis of the spindle 13, which is in the direction of the electrode 21 axis as well, with the electrode guide 61 being carried on the electrode guide holder 25. The electrode guide holder 25 is thusly moved down the electrode 21 from the proximal end of the electrode 21 held in the electrode holder 23, to the distal end of the electrode 21. This positions the electrode guide 61 at the tip of the electrode 21.

What this means is that applicant first uses his guide holder 25 to protect his electrode holder 23 during storage in the magazine 27 and during handling from the magazine 27 to the EDM spindle's chuck 19, to which the electrode holder 23 is mounted for machining. Once the electrode holder 23 is mounted, the projection tab engagement is released, and the electrode guide holder 25 is then moved down the electrode 21 to a position to guide the tip. The electrode 61 controls the tip position of the electrode.

The electrode guide holder 25 has a duel function which eliminates the need for a separate guide part at the tip of the electrode during machining. That separate guide part is needed by the prior art. None of the cited references disclose applicant's dual function feature, nor applicant's process.

Claims 1, 2, 8, 9, 10, and 11 have been amended herein above. It is urged that the amended claims presented herein distinguish the present invention over the cited prior art.

It is requested that the application be re-examined as to the claims presented herein and then be passed to issue. Should any minor issue remain concerning claim language, the Examiner is invited to telephone applicant's attorney at 215-568-4900.

Applicant wishes to thank the Examiner for the short telephone interview of June 19, 2007, wherein the alternate partial translation of Yoshiyuki was addressed.

No additional fees are believed to be required. In the event that an additional fee is required with respect to this communication, the Commissioner is hereby authorized to charge any additional fees, or credit any overpayment, to Paul & Paul Deposit Account No. 16-0750. (Order no. 5032)

Respectfully submitted,
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EXHIBIT "A"

In the examination of U.S. patent application 10/523,052:

ALTERNATE PARTIAL TRANSLATION OF PRIOR ART REFERENCE YOSHIYUKI: JA-8-229747-A
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offered by Seiwa Patent & Law, Tokyo, Japan
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[0008] Figure 1 is a front view of a main part of the electric discharge machine according to the present invention, and Figure 2 is a side view of the main part shown in Figure 1. A table 1 is surrounded by a work tank 5 which slides upward and downward on both sides of a seal 3, and a workpiece 6 is fixed to the upper surface of the table 1. Further, the table 1 and a column 7 movable in an X-axis direction are disposed on a bed (not shown), and the column 7 is provided with a spindle head 11. disposed on a front surface of a ram movable in a Y-axis direction along a Y-axis guide rail. A spindle 13 is provided on the spindle head 11 so as to be movable relative to the spindle in a Z-axis direction and pivotable about a center axis extending in the Z-axis. The spindle 13 at the bottom has a chuck 15 attached thereto through an insulating plate 14, and the chuck 15 concentrically grips, through a pull stud 21, a holder 19 having a small hole machining electrode 17 held by means of a collet chuck 16.

[0009] A support guide 23, which is located in proximity of the workpiece to guide a forward end of the small hole machining electrode 17 into a small hole, has a base part guided by a support guide guiding device 25 mounted on the side surface of the spindle head 11 and is movable in a direction parallel to Z-axis by means of driving means not shown. The support guide 23 also has a small hole formed for guiding the small hole machining electrode 17. The small hole of the support guide 23 is positioned on Z-axis line extending through the center axis of the spindle 13, i.e., on the center axis of the small hole machining electrode 17. The position of the support guide 23 relative to the workpiece 6 along the Z-axis is determined based on the thickness of the workpiece 6. A leading guide 27 has a leading block 29 provided at the end of the leading guide 27 so as to be slidable relative to the leading guide 27 in a direction

perpendicular to the Z-axis direction, and the leading block 29 can grip and release the small hole machining electrode 17 between the support guide 23 and the collet chuck 16 having the small hole machining electrode 17 held therein. Please note that the leading block 29 is moved in the direction perpendicular to the Z-axis direction and retreated to the outside of the machining area for the workpiece 6 except when it guides the small hole machining electrode 17 into the small hole of the support guide 23. Further, the leading guide 27 has a base part guided by a leading guide guiding device 31 mounted on the front surface of the column 9, so that it can be moved in a direction parallel to the Z-axis direction by means of driving means (not shown).

[0010] The column 7 is formed at the center of the front side with a loophole 33, and an electrode changer is provided in the space of the loophole 33. At an electrode change position, the holder 19 demounted from the chuck 15 of the spindle 13 and having the used small hole machining electrode 17 held therein is stored in an electrode magazine 34 of the electrode changer with the pull stud 21 gripped. Instead of the used small hole machining electrode 17, a holder 19 having a new small hole machining electrode 17 held therein is transferred to the spindle 13 until it is aligned with the center axis of the chuck 15 of the spindle 13, and is fixed in the chuck 15 by pulling the pull stud 21 therein. Figures 1 and 2 show a state where the spindle 13 is moved down by a little bit in the direction parallel to the Z-axis direction after changing of the electrode, the forward end of the small hole machining electrode 17 is received in the small hole of the support guide 23. The electric discharge machine according to this embodiment machines a small hole on the workpiece 6 by feeding the spindle 13 relative to the workpiece 6 in the Z-axis direction while rotating the spindle 13 about the center axis extending in the Z-axis direction with the forward end of the small hole machining electrode 17 received in the small hole of the support guide 23.